CLAIMS

1. A method for proof of the manufacturing technology used to fabricate electronic assemblies, said electronic assemblies containing a plurality of electronic modules mounted to a circuit board, said circuit board including a plurality of electrically conductive bonding pads for connection to a respective corresponding plurality of electrically conductive terminals of an electronic module, said plurality of electrically conductive bonding pads including at least one group of electrically conductive bonding pads, said group of bonding pads comprising any one of a row, or zone, or array, or sub-array of bonding pads; said electronic modules including electric terminals secured to said bonding pads on said circuit board, comprising the steps of:

fabricating a surrogate circuit board using said manufacturing technology, said surrogate circuit board replicating said circuit board at least in the principal thermal and mechanical features thereof, including size, shape, and bonding pads, wherein said surrogate circuit board includes a plurality of electrically conductive bonding pads for connection to a respective corresponding plurality of electrically conductive terminals of an electronic module, said plurality of electrically conductive bonding pads of said surrogate circuit board including at least one group of electrically conductive bonding pads;

said surrogate circuit board further including wiring for electrically individually connecting together each bonding pad in said group of bonding pads, excepting a first and second bonding pad in said group of bonding pads, with only one other bonding pad in said group of bonding pads, excepting said first and second bonding pads, to form a plurality of bonding pad pairs, exclusive of said first and second bonding pads;

said surrogate circuit board further including a first voltage bus, a ground bus, electrical bonding pads for securing a continuity monitoring device, wiring for connecting said first voltage bus to said first bonding pad,

and wiring for connecting an input of said continuity monitoring device to said second bonding pad;

fabricating a surrogate electronic module, said surrogate electronic module replicating said electronic module in at least the principal thermal and mechanical features thereof, including size, geometry and plurality of electrically conductive terminals, said plurality of electrically conductive terminals including a group of electrical terminals, said surrogate electronic module further including internal wiring connecting each one of said terminals in said group of electrical terminals to only one other terminal in said group of electrical terminals to form a plurality of pairs of terminals, said internal wiring being such as to define with said plurality of pairs of bonding pads and said first and second bonding pads of said surrogate circuit board a DC series circuit when said terminals are secured to associated bonding pads in said group of bonding pads with said first and second bonding pads defining first and second ends to said DC series circuit;

securing said surrogate electronic module to said row or zone or sub-array of bonding pads on said surrogate circuit board using said manufacturing technology to define said DC series circuit between said first and second bonding pads;

securing a continuity monitoring device to said surrogate circuit board, wherein said input of said continuity monitoring device is electrically connected to said second end of said DC series circuit, said continuity monitoring device including an indicator lamp;

applying a DC voltage to said first voltage bus, wherein said DC voltage is applied through said DC series circuit to said input of said continuity monitoring device so long as said DC series circuit is uninterrupted;

said continuity monitoring device being responsive to the application of a said DC voltage for preventing operation of said indicator lamp, and responsive to withdrawal of said DC voltage for operating said indicator

lamp to place said lamp in an operated condition and maintaining said display lamp operated thereafter to provide a persistent indication irrespective of the reapplication of said DC voltage;

subjecting said surrogate circuit board to stresses, said stresses including any one or more of bowing, twisting, temperature variation, sinusoidal or random vibration, and shock over a range of intensities and durations; and

inspecting said indicator lamp to determine if an interruption occurred in said DC series circuit.

2. The method of detecting transient failure of at least one connection in a set of electrical connections that secure an electronic module to a circuit board comprising the steps of:

creating a series electrical circuit through said set of electrical connections and corresponding electric terminals of said electronic module;

continuously monitoring said series electrical circuit for an interruption and producing a persistent indication in the event an interruption occurs in said series electrical circuit; and

subjecting said circuit board and the module secured to said circuit board to a variation in environmental condition to determine if such variation produces an interruption in said series circuit, and, if so, providing a persistent indication thereof.

3. The method of detecting transient failure as defined in claim 2, wherein said variation in environmental condition comprises shaking said circuit board in varying intensities.

4. The method of detecting transient failure as defined in claim 2, wherein said variation in environmental condition comprises exposing said circuit board to various ambient temperatures.

5. A test assembly, comprising in combination:

a circuit board, said circuit board including a first plurality of bonding pads for securing to terminals of an electronic module;

an electronic module supported on said circuit board, said electronic module including a first plurality of terminals;

said first plurality of terminals being bonded to respective ones of said plurality of bonding pads and defining therewith a first plurality of bond joints;

said first plurality of terminals of said electronic module and said first plurality of bonding pads of said circuit board each being wired to define a DC series circuit when said first plurality of bond joints is formed;

electronic means, supported on said circuit board, for monitoring the continuity of said DC series circuit and for producing a persistent indication of a break in said DC series circuit when said continuity is interrupted.

6. The test assembly as defined in claim 5, wherein said electronic means comprises a bi-stable electronic switch.

7. The test assembly as defined in claim 6, wherein said bi-stable electronic switch further comprises a flip-flop, said flip flop including a set input, a reset input and an output, and said flip flop being responsive to a break in said DC series circuit for switching said output from a first voltage state to a second voltage state; and an LED; said LED being coupled to said output for producing illumination when said output is in said second voltage state.

8. The test assembly as defined in claim 5, further comprising: a controller for supplying power to said electronic means, said controller being separate from said circuit board; and a power lead connected between said controller and said circuit board.

9. The test assembly as defined in claim 7, further comprising:

a controller, said controller positioned separate from and external to said circuit board;

said controller including a first momentary operate switch, said first momentary operate being normally closed; a second momentary operate switch, said second momentary operate switch being normally open; a source of voltage, and a circuit ground; and

an electric cable connected between said circuit board and said controller, said cable including a plurality of electrical leads;

10. A test assembly, comprising in combination:

a circuit board, said circuit board including a plurality of groups of bonding pads, each of said groups including multiple bonding pads for securing to terminals of an associated one of a plurality of electronic modules;

a plurality of electronic modules supported on said circuit board, each of said plurality of electronic modules including multiple terminals;

said multiple terminals of each of said plurality of electronic modules being bonded to respective ones of said mulitple bonding pads in an associated one of said plurality of groups of bonding pads to define a plurality of groups of bond joints;

said multiple terminals of each of said plurality of electronic modules and said mulitple bonding pads of each group of bonding pads each being wired to define a DC series circuit when said plurality of bond joints is formed, wherein a plurality of individual DC series circuits are defined;

electronic means, supported on said circuit board, for monitoring the continuity of said plurality of individual DC series circuits and for producing a persistent indication of a break in any of said DC series circuits when said continuity is interrupted.

11. The test assembly as defined in claim 10, wherein said electronic means further comprises:

a plurality of continuity testers, each of said continuity testers being associated with a respective one of said plurality of DC series circuits and each of said continuity testers for monitoring the continuity of a respective one of said plurality of DC series circuits and for producing a persistent indication of a break in continuity when said continuity of said respective one of said plurality of DC series circuits is interrupted;

12. The test assembly as defined in claim 11, wherein said continuity testers each comprise a bi-stable electronic switch.

13. The test assembly as defined in claim 12, wherein said bi-stable electronic switch further comprises a flip-flop, said flip flop including a set input, a reset input and an output, and said flip flop being responsive to a break in an associated one of said plurality of DC series circuits for switching said output from a first voltage state to a second voltage state; and an LED; said LED being coupled to said output for producing illumination when said output is in said second voltage state.

14. In combination,

a circuit board, said circuit board including a power bus, a circuit ground, a test bus, and a reset bus; said circuit board further including, a test series circuit;

a resettable electronic latch, said latch being mounted to said circuit board and including:

a first terminal for application of a first polarity voltage;

a second terminal for application of a circuit ground;

a /SET input;

a /RESET input; and

at least one output;

said electronic latch having said output set to a first output condition when circuit ground is momentarily applied to said /RESET input and having said output set to a second output condition when a circuit ground is momentarily supplied to said /SET input;

a first indicator LED associated with said electronic latch, said indicator LED being coupled to said output of said electronic latch for energizing said lamp when said output of said latch is in said second output condition;

a controller, said controller being separate from said circuit board, and including:

a first manually operable momentary operate switch, said first momentary operate switch being normally closed;

a second manually operable momentary operate switch, said second momentary operate switch being normally open;

a first lead for supplying a first polarity voltage to a first power bus on said circuit board;

a second lead for extending a circuit ground to ground on said circuit board ;

a third electrical lead extending to a test bus on said circuit board;

said first momentary operate switch normally connecting a first polarity voltage to said third lead, and momentarily interrupting said first polarity voltage to said third lead when said first momentary operate switch is manually operated;

a fourth electrical lead extending to a reset bus on said circuit board;

said second momentary operate switch being connected to said fourth electrical lead for momentarily extending a circuit ground to said fourth electrical lead when manually operated and normally preventing extension of said circuit ground to said fourth electrical lead;

said circuit board including a test series circuit;

said test series circuit normally coupling said first polarity voltage from said test bus to said /SET input of said electronic latch to place a first

polarity voltage at said /SET input so long as said test series circuit is uninterrupted and said first switch is unoperated;

bias means connected to said /SET input for placing said /SET input to circuit ground when said test series circuit is interrupted or when said first switch is manually operated, whereby said electronic latch switches to and latches said output to said second output condition to energize said first LED; and

a second LED mounted to said circuit board, said second LED being connected in circuit between said power bus and said ground, wherein said second LED is normally energized to indicate supply of said first polarity voltage and ground to said circuit board.

15. In combination:

a circuit board;

a plurality of electronic modules attached to said circuit board, each of said electronic modules containing a plurality of terminals for connection to a corresponding plurality of bonding pads on said circuit board, each of said electronic modules including wiring of said plurality of terminals and said circuit board containing wiring of said plurality of bonding pads that together define an electrical series circuit when said plurality of bonding pads of said circuit board are in contact with respective corresponding terminals of said electronic module to define a plurality of individual series circuits;

a plurality of electronic detectors mounted on said circuit board having an input connected to a respective one of said plurality of individual series circuits, each of said plurality of electronic detectors comprising a bistable electronic switch normally having a first output state when said respective one of said plurality of individual series circuits is uninterrupted and for switching to and maintaining a second output state when said series circuit is interrupted;

a plurality of indicators, each of said indicators being associated with a respective one of said electronic detectors for providing a visual indication when said respective one of said electronic detectors is in said second output state;

a controller for supplying a first polarity voltage to said series circuit, said controller being positioned in spaced relationship to said circuit board;

said controller including a first switch for momentarily interrupting each of said plurality of individual series circuits.